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Water Quality Trading and Agricultural Nonpoint Source Pollution: An Analysis of the Effectiveness and Fairness of EPA's Policy on Water Quality Trading

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WATER QUALITY TRADING AND AGRICULTURAL NONPOINT SOURCE POLLUTION: AN ANALYSIS OF THE EFFECTIVENESS AND FAIRNESS OF EPA's POLICY ON WATER QUALITY TRADING

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I. INTRODUCTION

Water quality problems continue to plague our nation, even though Congress passed the Clean Water Act (CWA) to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters"[1] more than three decades ago. During the past thirty years, the dominant sources of water pollution have changed, requiring us to seek new approaches for cleaning up our waters. Water quality trading has been heralded as an approach that can integrate market mechanisms into the effort of cleaning up our water. This Article examines the Environmental Protection Agency's (EPA) policy on water quality trading and the prospects for water quality trading to help improve water quality.

Part II briefly describes our water quality problems and causes. Part III examines the theoretical basis for trading and the EPA's Water Quality Trading Policy. Part IV discusses the potential impact of total maximum daily loads (TMDLs) on water quality trading, and Part V analyzes potential problems that water quality trading programs confront. Part VI addresses distributional and efficiency concerns that arise when considering trading and agricultural nonpoint source pollution. Part VII then examines issues relating to water quality trading and state laws before reaching conclusions and recommendations in Part VIII.

II. THE PROBLEM OF NONPOINT SOURCE POLLUTION

After initial passage of the CWA in 1972,[2] attention was focused on point sources of pollution.[3] Point sources (PSs) are usually associated with a pipe that discharges wastewater into streams, lakes, or rivers.[4] The National Pollutant Elimination Discharge Sys-

1. 33 U.S.C. § 1251 (2001 and Supp. 2003) (stating statute's objectives).

2. 33 U.S.C. §§ 1251-1387 (2000). This law, formally known as the Water Pollution Prevention and Control Act, amended previous water pollution control laws.

3. Douglas R. Williams, *When Voluntary, Incentive-Based Controls Fail: Structuring a Regulatory Response to Agricultural Nonpoint Source Water Pollution*, 9 WASH. U. J.L. & Pol'y 21 (2002) (shifting focus to point sources).

4. Martin T. Schultz & Mitchell J. Small, *Integrating Performance in the Design of a Water Pollution Trading Program*, in IMPROVING REGULATION: CASES IN ENVIRONMENT, HEALTH, AND SAFETY 380 (Paul S. Fischbeck & R. Scott Farrow eds., 2001). A point source is defined as:

> any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. *This term does not include agricultural stormwater discharges and return flows from irrigated agriculture.*

33 U.S.C. § 1362(14) (2001 and Supp. 2003) (emphasis added).

tem (NPDES), which regulates the granting of permits under the CWA,[5] represents this focus on PSs.[6] As significant water quality improvements resulted from the NPDES program and PS pollution reductions, it became clear that non-point source[7] (NPS) pollution contributes greatly to remaining water quality problems. It eventually became evident that PS reductions alone would not suffice to clean up waterways[8] and that the challenges presented by NPSs needed to be addressed.[9]

This Article primarily focuses on agricultural NPS pollution since it comprises the largest source of NPS pollution.[10] Phosphorous and nitrogen loading are the most serious NPS problems in agriculture.[11] The large "dead zone" in the Gulf of Mexico result-

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This definitional exemption for agricultural pollution, which otherwise would be considered point source pollution, first appeared as part of the 1977 amendments to the CWA, at which time the term "point source" was changed to read: "[t]his term does not include return flows from irrigated agriculture." *See* Drew L. Kershen, *Agricultural Water Pollution: From Point to Nonpoint and Beyond*, 9 WATER NAT. RES. & ENV'T 3, 3-4 (1995) (describing history of PS's definition). This was subsequently changed to the current definition as part of amendments in 1987. *See id.* at 4.

5. 33 U.S.C. §§ 1251-1387 (2000) (discussing NPDES).

6. OFFICE OF WATER, U.S. ENVTL. PROT. AGENCY, FINAL WATER QUALITY TRADING POLICY, *available at* http://www.epa.gov/owow/watershed/trading/finalpolicy2003.html [hereinafter EPA TRADING POLICY] (describing NPDES as critical in PS reduction).

7. Schultz & Small, *supra* note 4, at 380. Non-point sources are diffuse sources of pollution and include such things as agricultural fields, highways, and urban areas. *See id.*

8. *See* EPA TRADING POLICY, *supra* note 6 (describing current water pollution problems). "Approximately 40% of the rivers, 45% of the streams and 50% of the lakes that have been assessed still do not support their designated uses." *Id.* (footnote omitted).

9. *Trading Water Pollution Reduction Credits: Hearing Before the Subcomm. on Water Resources and Environment of the Comm. on House Transportation and Infrastructure*, 109th Cong. (2002) (statement of Benjamin H. Grumbles, Deputy Assistant Administrator for Water, United States EPA), *available at* 2002 WL 20318104 (stating NPS problems must be addressed).

10. *See* Suzie Greenhalgh & Amanda Sauer, World Resources Institute, Awakening the Dead Zone: An Investment for Agriculture, Water Quality, and Climate Change 3-4 (2003), *at* http://water.wri.org/pubs_description.cfm?PubID=3803 (noting that NPS pollution contributes as much as ninety percent of nitrogen flowing into Gulf of Mexico). While agriculture is the most difficult and variable NPS, urban runoff also presents problems, and the EPA recommends modeling or actual monitoring. EPA TRADING POLICY, *supra* note 6, at I. However, more and more urban runoff is now being channeled into the NPDES permit process. *See generally* 40 C.F.R. § 122.26 (2002).

11. *See* PAUL FAETH, WORLD RESOURCES INSTITUTE, FERTILE GROUND: NUTRIENT TRADING'S POTENTIAL TO COST EFFECTIVELY IMPROVE WATER QUALITY 1, 6-7 (2000) [hereinafter FERTILE GROUND], *available at* http://pdf.wri.org/fertile_ground.pdf (noting agriculture's accounting for 82% of nitrogen discharges and 84% of phosphorous discharges).

ing from nutrient pollution flowing from the Mississippi River testifies to the gravity of the problem of nutrient pollution.[12] For many years, virtually all agricultural NPS pollution was free from regulation.[13] While federal laws have begun to exercise jurisdiction over a few sources of agricultural NPS pollution, agriculture's relative immunity to regulation has pushed agricultural NPS pollution to the forefront of water pollution policy.[14]

III. Water Quality Trading: Theory and Policy

A. The Theory Behind Trading

The idea of using market incentives in water quality trading has been discussed in the environmental field for almost four decades.[15] The Clean Air Act utilizes trading and has spawned considerable writing on the topic.[16] Interest in trading led the EPA to release a draft of proposed trading rules for water quality in 1996.[17] In January of 2003, EPA released its final policy on water quality trading programs.[18]

The theoretical justification for water quality trading is both simple and compelling: allow the various parties that contribute pollution to a water body, using their particular and specialized

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12. *See* Jairo Escobar, United Nations, La Contaminación de los Ríos y sus Efectos en las Áreas Costeras y el Mar [The Contamination of Rivers and Its Effects on Coastal Areas and the Sea] 10 (2002) (using outflow of Mississippi River as one of most extreme examples of land-based pollution of rivers adversely affecting oceans). *See also* Donald A. Goolsby et al., Flux and Sources of Nutrients in the Mississippi-Atchafalaya River Basin 14 (1999).

13. *See* J.B. Ruhl, *The Environmental Law of Farms: 30 Years of Making a Mole Hill Out of a Mountain,* 31 Envtl. L. Rep. 10203 (2001), WL 31 ELR 10203, *1 [hereinafter *Environmental Law of Farms*] (discussing agriculture's virtual immunity from environmental legislation).

14. *See id.* at *7-9 (describing regulatory attempts to reduce NPSs). Those states that have tried to regulate NPSs have not implemented them for agriculture. *Id.* at *9.

15. *See* Robert V. Percival et al., Environmental Regulation: Law, Science, and Policy 165 (3d ed. 2000) (explaining history of economic incentive approaches).

16. Office of Policy, Economics, and Innovation, Environmental Protection Agency, The United States Experience with Economic Incentives for Environment (Jan. 2001), *available at* http://yosemite1.epa.gov/ee/epa/eermfile.nsf/vwAN/EE-0216B-13.pdf/$File/EE-0216B-13.pdf [hereinafter U.S. Experience] (stating "EPA is well known for its use of emissions trading as a key feature of its program to control acid rain.").

17. Environmental Protection Agency, 1996 Effluent Trading in Watershed: Policy Statement (1996), *available at* http://www.epa.gov/owow/watershed/trading/tradetbl.html (explaining EPA's policy concerning trading in watersheds).

18. *See* EPA Trading Policy, *supra* note 6 (stating EPA's final policy on Water Quality Trading).

knowledge of their activities, to remedy the problem themselves by using a market approach that encourages the party with the lowest pollution abatement costs to reduce its pollution loading. A successful trading program's degree of cost saving depends on parties with great differences in costs for pollution reductions.[19] Users with a high cost to reduce their pollution loading can simply pay those with a lower cost of abatement to do additional abatement in place of those with high costs.

Economic theory suggests that trades will occur until the marginal cost for pollution reductions is the same for all pollution sources in a watershed.[20] If this occurs, then the most cost efficient way of reducing pollution has been found. Trading contrasts with the "command-and-control" approach to regulation in which a bureaucratic structure assigns certain technologies, methods, or limitations to polluting parties with minimal consideration of the differences in the marginal cost of reductions by different parties.

In addition to achieving least-cost pollution reductions, trading "capitalizes on economies of scale and the control cost differentials among and between sources," and increases the self-determination of the parties involved.[21] The market-based approach of trading can "create economic incentives for innovation, emerging technology, voluntary pollution reductions, and greater efficiency in improving the quality of the nation's waters."[22] The possible virtues of trading spawned rave reviews and great excitement accompanying the unveiling of the EPA's water quality trading policy.[23] While some already sing the praises of water quality trading as a way of

19. *See, e.g.*, U.S. ENVTL. PROT. AGENCY, EPA REGION 10 – IDAHO – LOWER BOISE EFFLUENT TRADING DEMONSTRATION PROJECT, *at* http://www.epa.gov/owow/watershed/tradelinks.html. Assessment of cost differentials for reductions must take into account not only the possible costs of NPS reductions but also the nature of the PSs involved. *See* FERTILE GROUND, *supra* note 11, at 32-37. This requires careful analysis of each individual watershed's situation as the cost of reductions in watersheds can vary tremendously. For example, one must consider factors such as the size of point source dischargers like municipal treatment plants in the watershed since phosphorous removal by some methods becomes much more economical per gallon of water treated as the size of the plant increases. *Id.* at 25-26.

20. *See* Schultz & Small, *supra* note 4, at 384. Attainment of equality of marginal costs among polluters assumes that transaction costs do not exist. *Cf.* R.H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960). *See also* EPA TRADING POLICY, *supra* note 6 (describing water trading program's efficiency).

21. *See* EPA TRADING POLICY, *supra* note 6 at I (stating benefits of trading).

22. *See id.* (stating trading's other possible benefits). The EPA estimated that "flexible approaches to improving water quality could save $900 million [ ] annually compared to the least flexible approach." *Id.*

23. *See, e.g.*, Editorial, *Pint for Pint*, WASH. TIMES, Jan. 25, 2003, at A11. *See also* Editorial, *The Color of Water*, WALL ST. J., Jan. 21, 2003, at A18.

improving the quality of our waters with less money expended,[24] others are far more reserved in their assessment.[25]

B. EPA Policy

EPA policy on water quality trading contains elements to consider when designing a water quality trading program.[26] The EPA emphasizes that all decisions on potential trading programs should be determined on a case-by-case basis, and that all trading programs must comply with the CWA.[27] EPA also notes that trading must occur within clearly circumscribed boundaries of watersheds or a TMDL area, as this helps ensure that water quality improvements will appear.[28] Furthermore, EPA states that trading programs should focus primarily on nutrient (i.e., phosphorous and nitrogen) pollution and sediment loading.[29]

The EPA encourages a system in which tradable credits may be created only when reductions exceed reductions required by regulatory authority or by a TMDL.[30] Other considerations required to

24. *See, e.g.*, David W. Riggs, *Market Incentives for Water Quality*, in THE MARKET MEETS THE ENVIRONMENT 167 (ed. Bruce Yandle, 1999). *See also* EPA TRADING POLICY, *supra* note 6 (describing benefits of trading as greater flexibility, greater environmental benefits than those achieved under old law, and decreased cost).

25. *See, e.g.*, Ann Powers, *Reducing Nitrogen Pollution on Long Island Sound: Is There a Place for Pollutant Trading?*, 23 COLUM. J. ENVTL. L. 137, 196, 214-15 (1998) (noting more money may be necessary to clean up water).

26. EPA TRADING POLICY, *supra* note 6, at III (listing considerations for water quality trading program design).

27. *Id.* at I, III.A (noting EPA's case-by-case approach and requirement of compliance with CWA).

28. *Id.* at III B. Interstate watersheds present a difficult scenario as the water quality standards for different states within the same watershed may vary. This could lead to trading programs with different goals and standards. In such a case, "EPA can require . . . that uniform WQS [water quality standards] apply to interstate waters." Robert W. Adler, *Integrated Approaches to Water Pollution: Lessons from the Clean Air Act*, 23 HARV. ENVTL. L. REV. 203, 254 (1999) [hereinafter *Lessons from the Clean Air Act*]. One example of this is the Great Lakes Water Quality Initiative. *See generally* 33 U.S.C. § 1268(c)(2) (2000).

29. EPA TRADING POLICY, *supra* note 6, at III.C. Other forms of trading may be approved but would receive greater scrutiny. *Id.* Currently, EPA does not support trading of persistent bioaccumaltive toxics (PBTs) but might consider them in the future depending on results of research and possible pilot programs. *Id.* While it is very difficult to quantify the amount of nutrients coming off of farmland, it is also true that reducing NPS pollution in a PS-NPS trade "can also have the additional advantage of decreasing sediment loads." *See* FERTILE GROUND, *supra* note 11, at 3. The importance of the additional reduction of sedimentation is tremendous since siltation is the primary cause of water quality problems in 51% of the impaired rivers in the U.S. *See id.* at 7.

30. EPA TRADING POLICY, *supra* note 6, at III.D (noting that any PS or NPS would have to reduce beyond any waste load or load allocation for that source). Trading would not be allowed as a way to comply with existing technology-based effluent limitations except as expressly authorized by federal regulations. *See id.* at

ensure compliance with the CWA include use of standard existing methodologies for measuring PS pollution,[31] compliance with anti-backsliding and anti-degradation provisions,[32] clearly defined units of trade,[33] public participation and access to information,[34] mechanisms for enforcement,[35] and legally-recognized methods to calculate pollution reductions of NPSs that give rise to credits.[36] Programs should also include publicly available, periodic evaluations of trading programs.[37] Such evaluations should consider actual removal efficiencies, water quality changes or improvements, and the economics of the trading, including the price of credits per unit and the transaction and administrative costs of the program.[38]

Another prerequisite noted by EPA for engaging in a trading program consists of determining baselines for the creation of credits.[39] EPA's policy states that in the absence of a TMDL, baselines should be established by "the level of pollutant load associated with existing land uses and management practices that comply with applicable state, local, or tribal regulation."[40] The issue of baselines implicates the efficiency and distributive concerns, which are the focus of Part VI of the Article. Before considering such concerns, however, this Article will examine how baselines also relate to another program involving calculations of pollution loading: TMDLs.

III.E.4. However, EPA did say that it would consider adding provisions for trading in future laws regarding technology-based effluent limits. *See id.* *See also* U.S. EXPERIENCE, *supra* note 16, at 106 ("Of concern is the CWA requirement that existing, expanding, and new facilities—including publicly owned treatment works, industrial dischargers, stormwater programs, and coastal zone measures—meet all applicable technology-based requirements. This requirement appears to represent a severe obstacle to trading.").

31. *See, e.g.*, EPA TRADING POLICY, *supra* note 6, at III.F (explaining necessary conditions to meet CWA's requirements).

32. *Id.* at III.F (noting how compliance is achieved).

33. *Id.* at III.G.2. When an NPDES permit is involved with the trade, the units should reflect those of the NPDES permit. *Id.*

34. *Id.* at III.G.6 (helping to strengthen effectiveness by increasing public awareness).

35. *Id.* at III.G.1. These might include legislation, rulemaking, or private contracts. *See id.*

36. EPA TRADING POLICY, *supra* note 6, at III.F.4. The methods for calculating NPS reductions should include a way to account for the greater uncertainty associated with NPS pollution. *See also id.* at III.G.4 (addressing use of trading ratios to account for uncertainty of NPS pollution reduction).

37. *Id.* at III.G.7 (evaluating both environmental and economic aspects). The evaluations should be publicly available and any changes made to the program should be subject to public notice and comment. *See id.*

38. *Id.* at III.G.7 (highlighting individual factors for evaluation).

39. *Id.* at III.D. The Trading Policy notes that such baselines must "be derived from and consistent with water quality standards." *Id.*

40. *Id.* at III.D (explaining how to establish baseline without TMDL).

IV. TMDLs: Impacts on Trading and the Allocation-Baseline Analogy

A TMDL calculates the amount of a pollutant that a water body can receive and still meet the water quality standard (WQS) designated for the water body. TMDLs must be established where effluent (discharge) limitations on PSs have been insufficient to meet WQSs.[41] EPA estimates that more than 40,000 TMDLs for 20,000 bodies of water still need to be established throughout the United States.[42] While development of TMDLs comes at great cost,[43] lawsuits against EPA have forced the development of TMDLs.[44] Even though water quality trading has been slow to develop in spite of its great theoretical promise,[45] the need to comply with TMDLs may promote the use of trading.[46] Trading could help achieve the re-

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41. 33 U.S.C. § 1313(d)(1)(A) (2000) (setting requirements for creation of TMDLs).

42. *Trading Water Pollution Reduction Credits, Hearing Before the Subcomm. on Water Resources and Environment of the Comm. on House Transportation and Infrastructure,* 109th Cong. 8 (2002) (statement of Rena Steinzor, professor, University of Maryland School of Law), 2002 WL 20318109, at 8 [hereinafter Steinzor Testimony].

43. *See, e.g.*, Virginia Dep't of Conservation and Recreation, Virginia Water Quality Improvement Fund Cooperative Nonpoint Source Pollution Program and the Clean Water Act Section 319 Nonpoint Source Pollution Program 12-13 (2002) (estimating that development of TMDLs and implementation plans, without counting actual implementation, to be approximately $59.3 million in Virginia), *available at* http://www.epa.gov/reg3wapd/nps/accomplishments/2001/VA2001AnnualReprt.pfd; *see also, e.g.*, California State Water Res. Control Bd., Structure and Effectiveness of the State's Water Quality Programs: Section 303(d) of the Federal Clean Water Act and Total Maximum Daily Loads (TMDLS): Report to the Legislature Pursuant to AB 982 of 1999 17 (2001), *available at* http://www.swrcb.ca.gov/tmdl/docs/ab982rpt_final.doc ("Currently, the SWRCB [State Water Resources Control Board of California] estimates the development of an average TMDL to be approximately $600,000.").

44. Oliver A. Houck, The Clean Water Act TMDL Program: Law, Policy, and Implementation 22-23 (1999) (demonstrating connection between litigation and proliferation of TMDLs).

45. U.S. Experience, *supra* note 16 at 99-100 (discussing trading difficulties regarding air pollution).

46. *Id.* A functioning trading program sometimes might constitute a way to avoid the need to establish a TMDL if the trading program gave sufficient promise of meeting water quality standards. *Cf.* EPA Trading Policy, *supra* note 6, at III.E.2. ("If pre-TMDL trading does not result in the attainment of applicable water quality standards, EPA expects a TMDL to be developed."); *see also* Fla. Stat. ch. 403.067(4) (2002) (noting that state must add water body to state's TMDL list if "water quality standards are not being achieved and . . . other pollution control programs . . . are not sufficient to result in attainment of applicable surface water quality standards"). This means that successful design and implementation of a trading program, even if administratively difficult and expensive, might still present the best option if it avoids the need to establish a TMDL. The trading program would involve generation of both information and actual water quality improvements, while the expense of a TMDL creates lots of information about

ductions necessary to comply with TMDLs and regulatory controls under the CWA, which would be more cost effective than making existing regulations of PSs stricter.[47]

TMDLs create a cap above which no pollution will be allowed into a specific area,[48] thereby creating a "fully closed" trading system.[49] Once a TMDL has been established, several different approaches can be taken to meet the TMDL. One approach involves first determining the amount of pollutant load that occurs naturally and as a result of NPSs, and then adding a mandated "margin of safety."[50] If any loading capacity remains, it will be divided up among PSs.[51] Following this approach, if natural and NPS pollution exceed the TMDL, then no PS discharges will be allowed. Nevertheless, unregulated NPSs might continue polluting because of the lack of NPS regulation.[52] If PSs wish to continue activities that give rise to pollution loading, they must secure reductions from NPSs in the watershed by paying the NPSs to reduce their pollutant

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water quality but no actual water quality improvements. Once a TMDL has been established, EPA does not support use of a trading program to delay implementation of an approved TMDL. *See* EPA TRADING POLICY, *supra* note 6, at III.E.3.

47. *Cf.* EPA TRADING POLICY, *supra* note 6, at I, III (listing EPA's specific trading objectives, including reducing cost of implementing TMDLs through greater efficiency and flexible approaches).

48. *See* FERTILE GROUND, *supra* note 11, at 13; *see also* Powers, *supra* note 25, at 152 n.77 (noting that, while EPA has not always used "open" vs. "closed" market terminology, open market system would not be available under TMDL).

49. *See* U.S. EXPERIENCE, *supra* note 16, at V (noting that trading programs may fall within two distinct structures: one is uncapped, or open system, and other is capped, or closed system). An uncapped system may allow pollution to increase if existing polluters increase their contributions or if new polluters enter the market. *Id.* In such a system, a polluter may earn credits for any pollution reductions below a stated baseline; usually, the baseline occurs in the context of a permit. *Id.*

In contrast to this possibility of increased pollution, a closed or capped system sets a specific limit on how much pollution can occur in a specified area. *Id.* It is important to make sure that caps are set on actual, as opposed to permitted, discharges. The failure of the RECLAIM program to set a cap in California resulted in such a cheap and plentiful supply of credits that the credits did not serve as an incentive to reduce pollution by investment in pollution abatement. STEINZOR TESTIMONY, *supra* note 42, at 6. A closed or capped system seeks to achieve a specific environmental goal and assigns credits to existing sources of pollution. *See* U.S. EXPERIENCE, *supra* note 15, at 7.

A trading system should, in order to work towards the goal of the CWA, include a cap that steadily declines. *See* STEINZOR TESTIMONY, *supra* note 42; *see also* CWA § 101(a)(1), 33 U.S.C. § 1251(a)(1) (stating that "[t]he objective of this chapter is to *restore* and maintain the chemical, physical, and biological integrity of the Nation's waters" (emphasis added)); *see also* Powers, *supra* note 25, at 176-77.

50. *See* 33 U.S.C. § 1313(d)(1)(C) (2000).

51. *Cf.* 40 C.F.R. § 130.2(g)-(i) (defining allocations to PSs, NPSs, and relationship between them within TMDL).

52. *See* Schultz & Small, *supra* note 4, at 388 (discussing agriculture's relative immunity to regulation).

loading. This situation highlights the lack of regulatory authority over NPSs and shifts the entire burden for reduction onto already-regulated PSs. Forcing PSs to pay for NPS reductions to improve water quality implicates the equitable and distributional concerns addressed in Part VI.

The federal government has taken some steps to allow NPSs to voluntarily get involved in reducing pollution.[53] While these efforts have benefited some waters, success has been limited.[54] For a short time it appeared that new rules from EPA for the TMDL program might force states to address NPS pollution by insisting on development of TMDLs unless federally enforceable laws offered assurance that water quality standards would be met.[55] The new rules would have required all TMDLs to contain an implementation plan that EPA could either accept or reject.[56] These rules, however, never went into effect and were finally withdrawn by EPA.[57] Nonetheless, existing regulations still require that pollution be divided into load allocations for NPSs and waste load allocations for PSs.[58] Even this gross allocation between PSs and NPSs can present difficulties.[59]

53. *See, e.g.*, Williams, *supra* note 3, at 72-78 (outlining 33 U.S.C. § 1329 grant program directed towards NPS pollution).

54. *Id.* at 77. Williams asserts that, in large part, the failure of the § 319 (33 U.S.C. § 1392) program stems from the fact that it contains no enforceable requirements for NPSs. *Id.* at 72-78.

55. EPA Revisions to Water Quality Planning, 65 Fed. Reg. 43,586-43,590 (July 13, 2000) (explaining rules for TMDL program).

56. *Id.* at 43,595-96 (noting that new rules would "provide EPA with an element missing from the current regulations, i.e., assurance that the TMDL will in fact be implemented"). One commentator noted that the inclusion of implementation plans in the definition of TMDL provoked much resistance because inclusion would effectively give EPA the power to accept or reject implementation plans. Oliver A. Houck, *The Clean Water Act TMDL Program V: Aftershock and Prelude*, 32 ENVTL. L. REP. 10,385, 10,411 (2002) [hereinafter *Aftershock and Prelude*]. Moreover, this would then be subject to judicial review at the hands of citizen groups. *See id.*

57. *See* Revised Rule, 66 Fed. Reg. 53,044 (Oct. 18, 2001) (establishing April 20, 2003 as effective date of revisions to EPA's Total Maximum Daily Load and National Pollutant Discharge Elimination System Program regulation published in Federal Register on July 13, 2000); Final Rule, 68 Fed. Reg. 13,608 (Mar. 19, 2003) (withdrawing rule because EPA believes that significant changes need to be made to July 2000 rule before it could represent workable framework for efficient and effective TMDL). "[F]urthermore, EPA needs additional time beyond April 30, 2003 to decide whether and how to reuse the currently-effective regulations implementing the TMDL program in a way that will best achieve the goals of the CWA." *Id.*

58. *See* EPA Water Program Definitions, 40 C.F.R. § 130.2(h) (2002) (defining TMDL as sum of allocations for PSs and NPSs).

59. For examples of very different approaches to allocate loading, compare Florida's approach, *infra* notes 155-62 and accompanying text, with the approach of Equal Marginal Percent Reduction, *infra* note 130 and accompanying text.

These obstacles are analogous to the challenges encountered in establishing a baseline for trading.[60]

V. POTENTIAL PROBLEMS TO ADDRESS IN TRADING PROGRAMS

While an excellent idea in theory, trading has been slow to come into actual usage and has seldom resulted in many trades.[61] This Part highlights a few problems with water quality trading and criticisms of trading programs that may contribute to the lackluster adoption and performance of trading.

A. Trading Units and the "Right" to Pollute

As noted in EPA's guidelines, trading requires a clear, definable unit. Part of a clear, definable unit is the property right necessary to make use of the credit.[62] On one hand, assigning polluters a property right to pollute has drawn great criticism.[63] On the other hand, the argument has been made that not allowing pollution also confers a property right.[64] The concept of granting pollution "rights" potentially conflicts with TMDLs[65] or with state laws.[66]

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60. For further discussion of the difficulties encountered in establishing a baseline for trading, see *infra* notes 125-39 and accompanying text.

61. Schultz & Small, *supra* note 4, at 388 (noting that twenty-six trading programs referred to in EPA's 1996 Draft Framework for Watershed Based Trading have failed to generate trades and cost savings that had been predicted); *see also* Powers, *supra* note 25, at 139-40, 194 (noting that experiences with previous market-based programs make it possible that even if nitrogen trading program was established amount of trading would be minimal and that few trades have occurred in existing programs); *see also* U.S. EXPERIENCE, *supra* note 16, at 99-100 (noting that despite potential benefit of trading and considerable effort by EPA and states to implement concept, trading has yet to live up to its full promise).

62. EPA TRADING POLICY, *supra* note 6, at III.G.2; *cf.* Kenneth D. Frederick, *Marketing Water: The Obstacles and the Impetus, in* THE RFF READER IN ENVIRONMENTAL AND RESOURCE MANAGEMENT 144 (Wallace E. Oates ed., 1999) (stating that "[e]fficient markets also require well-defined, transferable property rights").

63. *See* Sean Blacklocke, *Effluent Trading in South Carolina, in* THE MARKET MEETS THE ENVIRONMENT 224 (Bruce Yandle, ed. 1999); *see also* Schultz & Small, *supra* note 4, at 384; Williams, *supra* note 3, at 28 (observing idea that farmers must be "'bribed' to engage in sound, conservation-minded practices has had the subtle effect of promoting the idea that farmers have a 'right' to engage in environmentally destructive practices").

64. *See* R.H. Coase, *supra* note 20, at 2 (1960) (focusing on question of "who gets to harm who?").

65. Tension would exist if a polluter received a "right" to pollute under a TMDL that subsequently needed revision in order to comply with water quality standards; if the state then reduces the right to pollute, could the holder of the right invoke the Fifth Amendment's prohibition on takings?

66. BUREAU OF WATERSHED MGMT., FLORIDA DEP'T OF ENVTL. PROT., A REPORT TO THE GOVERNOR AND THE LEGISLATURE ON THE ALLOCATION OF TOTAL MAXIMUM DAILY LOADS IN FLORIDA § 4.1.3 (Feb. 1, 2001) [hereinafter REPORT TO THE GOVERNOR] (explaining that technical advisory committee in Florida noted that right to

B. Lack of Information

Another hurdle trading faces before harnessing the potential benefits of market economics is a problem that markets in practical application often fall prey to — lack of information.[67] Equality of marginal cost will never result from a trading program if transaction costs are too high or information sharing among the sources on their respective costs is not readily available.[68] This lack of information about the relative costs of pollution reduction often prevents realization of the full theoretical benefits that could arise from trading.[69]

C. Modeling

EPA has emphasized that a trading program must contain a methodology for counting the credits that have been created.[70] Many commentators have noted the difficulty of measuring reductions in loading by NPSs.[71] Computer modeling has appeared as

pollute conflicts with existing regulations in State of Florida); FLA. ADMIN. CODE r. 62-4.242(4) (2003) (determining that property right to pollute conflicts with "equitable abatement" provisions of Florida Administrative Code).

67. *See* Schultz & Small, *supra* note 4, at 386 (discussing challenges of improving regulation through trading).

68. *Id.* (identifying information-sharing as key step in implementing trading program); *see also* R.H. Coase, *supra* note 20. The World Resources Institute has developed a website called NutrientNet which seeks to serve as a forum for potential buyers and sellers of water quality trading credits to locate each other, thereby trying to reduce both informational issues and transaction costs. *See* What is NutrientNet?, *at* http://www.nutrientnet.org/prototype/html/index.html (noting that transaction costs can be substantial barrier to trading and that NutrientNet seeks to serve as way to lower transaction costs).

69. Schultz & Small, *supra* note 4, at 386 (examining problems in designing and implementing water pollution trading programs).

70. EPA TRADING POLICY, *supra* note 6, at III.G.4 (determining that standardized protocols are necessary to qualify credits). Procedures of states and tribes should account for the generalizations and use of credits in NPDES permits. *See id.* (finding that states and tribes should discharge monitoring reports to track generation and use of credits between sources and assess compliance).

71. *See, e.g.*, FERTILE GROUND, *supra* note 11, at 29 (observing that while animal production is substantial source of nutrient pollution, good procedures for estimating loading from different forms of animal production are lacking). Further data collection and analysis, more information on alternative systems, and more profitable, less resource-demanding alternatives could be identified. *See id.* (noting that this information may be significant but cannot be explored because of lack of information); *see* Norman Sanjem, *Case Study: Minnesota Pollutant Trading at Rahr Malting Co.*, Part X [hereinafter, *Case Study: Minnesota*] (setting out five obstacles to measuring reduction in loading by NPSs), *available at* http://www.pca.state.mn.us/hot/es-mn-r.html (last modified Oct. 29, 1997); *see also* STEINZOR TESTIMONY, *supra* note 42 (noting that we lack sufficient technology and information to do accurate assessments of loading under control and best management practices situations).

the accepted method to estimate loading and reductions. Modeling allows for action even when complete and accurate monitoring information from which to make decisions is not available.[72] Models, however, are not perfectly accurate and may produce very different results depending on the adequacy of the data and differing interpretations of results.[73] Skeptics of modeling claim that it is possible to "model anything, any time, any place, for anyone."[74] Despite such a cynical view of modeling as a tool to "prove" what one wants, modeling has become more accepted and refined.[75]

Nevertheless, modeling is subject to "gaming."[76] Gaming is the process of tinkering with the many assumptions that comprise the complex equations used in modeling.[77] By slightly altering the many assumed values in equations, a modeler can often substantially change the outcome of the model with only minor and apparently reasonable changes to the variable assumptions. The dramatic changes in the result of complex equations due to miniscule changes in input information have been called "sensitive dependence on initial conditions."[78] This cannot be entirely avoided since modeling is not based on perfect information; as long as models require assumptions of certain values in their equations, the possibility for abuse remains.

72. *Lessons from the Clean Air Act, supra* note 28, at 243-44 (noting that use of models in lieu of definite proof is useful antidote to financial and practical limitations of inadequate monitoring networks, and allows progress in face of inevitable uncertainty).

73. Charles D. Case, *Problems in Judicial Review Arising from the Use of Computer Models and Other Quantitative Methodologies in Environmental Decisionmaking*, 10 B.C. ENVTL. L. REV. 251, 274 (1982) (noting that because of policy choice and uncertainty in environmental decisions resting on models and relative crudeness of scientific ecological knowledge, such decisions rest in subjective assumptions and inadequate database).

74. *Id.* at 279 n.150. "Without adequate understanding of the empirical context, without full realization of the embedded assumptions, and without appreciation of the exclusions and omissions, a potential used is easily down the garden path." *Id.*

75. *Lessons from the Clean Air Act, supra* note 28, at 269 (discussing use of TMDL model).

76. *See, e.g., Aftershock and Prelude, supra* note 56, at 10,399-400 (explaining widespread practice of gaming); *see also Lessons from the Clean Air Act, supra* note 28, at 244-45 (noting charge that models are abused to avoid stricter obligations).

77. *See, e.g., Aftershock and Prelude, supra* note 56, at 10,399-400 (stating "[c]laims are made for wholly past reductions, for the same reductions several times, and for reductions that never happened, happened only ephemerally, or never will happen.").

78. Peter Miller & William E. Rees, *Introduction* to ECOLOGICAL INTEGRITY: INTEGRATING ENVIRONMENT, CONSERVATION, AND HEALTH (David Pimentel, Laura Westra & Reed F. Noss eds., 2000) (noting also that this relates to chaos theory).

Either inherent variability or gaming can lead to predictions of an improvement in water quality that does not actually take place.[79] These difficulties indicate that water quality monitoring in receiving water bodies is the best way to quickly identify a failure to create real water quality improvements.[80] In addition to the uncertainty that arises from modeling, other factors also contribute to uncertainty in NPS reductions.[81] The myriad uncertainties are usually dealt with by using a safety factor in the calculation of NPS reductions.[82]

D. Issues of Legality

In addition to the considerable technical difficulties, potential legal problems also confront trading programs. As EPA notes, all trading programs must comply with the CWA.[83] EPA implies that compliance could be accomplished by modifying the NPDES per-

79. *Lessons from the Clean Air Act*, *supra* note 28, at 244-45 (discussing problems with use of models in lieu of definitive proof). For further discussion on the uncertainty of the use of models as predictors, see *Aftershock and Prelude*, *supra* note 56.

80. *Cf.* EPA TRADING POLICY, *supra* note 6, at III.G.7 (noting that trading program evaluations should include ambient water quality monitoring as way to ensure that designated water uses are not impaired as result of trading).

81. *See id.* at III.G.4 (noting that some other reasons for uncertainty of reductions by NPSs listed by EPA include variability in precipitation, variable performance of land management practices, and effect of soils, plant cover and slope on pollutant load delivery to receiving waters).

82. *See, e.g.*, ROSS & ASSOCS. ENVTL. CONSULTING, LTD., LOWER BOISE RIVER EFFLUENT TRADING DEMONSTRATION PROJECT: SUMMARY OF PARTICIPANT RECOMMENDATIONS FOR A TRADING FRAMEWORK 15 (2000) [hereinafter BOISE RIVER TRADING], *at* http://www.deq.state.us/water/tmdls/lowerboise_effluent/lowerboiseriver_effluent.htm (using "uncertainty discount" to deal with variability inherent in NPS reduction practices); *see also* FERTILE GROUND, *supra* note 11, at 15 (noting that in Dillon Creek Reservoir trading program in Colorado, only half of expected reductions from NPSs can be applied to offset PS contributions).

> [O]nly one third of the load reduction from nonpoint sources could be applied against point source requirements (a 3:1 trading ratio). The rest of the load reduction produced is essentially an "environmental credit" to assure the achievement of water quality goals and account for the greater uncertainty inherent in nonpoint source loads.

Id. at 36; *see also* EPA TRADING POLICY, *supra* note 6, at III.G.4 (advocating use of greater than 1:1 trading ratios, conservative assumptions, or retirement of portion of NPS credits for each transaction as way to deal with uncertainty of reductions by NPSs).

83. EPA TRADING POLICY, *supra* note 6, at III.A (requiring that water quality trading comply with CWA); *see* Schultz & Small, *supra* note 4, at 385. Schultz & Small also believe that the lack of trading programs might be partly due to regulators placing more emphasis on enforcement than on reducing compliance costs.

mits of PSs that purchase water pollution credits.[84] Some express skepticism that EPA has the authority to modify NPDES permits. One commentator warns that careful companies should hesitate to engage in trades based on EPA assertions of legality through clauses added to NPDES permits.[85] Others, however, do not see this as a problem.[86] EPA's support for water quality trading and assertions of legality would likely prevail on regulatory grounds until the CWA could be amended should amendment prove necessary.[87]

Compliance with the CWA also requires trading programs in TMDL areas to meet applicable TMDL requisites. While a TMDL needs EPA approval, laws and regulations need to be changed so that minor modifications to a TMDL program due to trading do not automatically require EPA approval. If EPA will require approval for any allocation changes to a TMDL that result from trading, such excessive oversight could inhibit trading.[88]

Enforcement is another aspect of legality. To enforce trading rules, what constitutes "compliance" for NPS reductions needs to be examined. Does compliance simply consist of certain Best Management Practices (BMPs)[89] or other specified activities, which, accord-

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84. *See* EPA TRADING POLICY, *supra* note 6, at III.F.2 (noting EPA supports several flexible approaches for incorporating provisions for trading into NPDES permits).

85. STEINZOR TESTIMONY, *supra* note 42 (asserting that allowing trading to demonstrate compliance with permit unnecessarily exposes NPDES holder to legal liability).

86. *See* Powers, *supra* note 25, at 185 (suggesting that, within certain confines, Clean Water Act still permits trading).

87. *See* Blacklocke, *supra* note 63, at 226 (asserting that trading programs are unlikely to be ruled illegal); *cf.* U.S. EXPERIENCE, *supra* note 16, at 67:

> EPA first applied the concept of marketable emission permits in the mid-1970s as a means for new sources of emissions to locate in non-attainment areas without causing air quality to worsen. New sources and existing sources that wanted to expand their facilities were required to offset their emissions by acquiring emission reduction credits from existing sources. This important but modest beginning was based on an interpretation of the Clean Air Act, rather than on a specific statutory authority. EPA's Offset Policy was included in the 1977 amendments to the Clean Air Act statute.

Id.

88. *Cf. Lessons from the Clean Air Act*, *supra* note 28, at 269 (noting excessive review of state implementation plans (SIPs) under Clean Air Act has bogged down process).

89. *See* FLA. ADMIN. CODE r. 18-2.017(8):

> "Best management practices" means methods, measures or practices that are developed, selected, or approved by agencies to protect, enhance and preserve natural resources. They include, but are not limited to, engineering, conservation, and management practices for mining, agriculture, silviculture, and other land uses, that are designed to conserve the

ing to a computer model, should result in a certain amount of water quality improvement in an average year? This definition of compliance potentially allows much greater pollution loading during a year of heavy rainfall than a model for calculating credits might conclude from average rainfall. A second approach might define compliance as monitoring that occurs at the edge of the NPS property indicating a reduction in loading.[90] While this would appear to be the safest and surest definition of compliance from an environmental standpoint, the feasibility of direct monitoring for NPSs is often low. A third concept of compliance could require actual water quality improvement in the receiving water body.

While EPA did not explicitly address how to define compliance in the context of a trading program, arguments can be made that EPA policy could support almost any one of these conceptions.[91] All the various complexities and difficulties of assessing compliance—even if BMPs or specified activities are considered "compliance"—may diminish enthusiasm for a trading program involving PSs and NPSs.[92]

EPA also recommends looking to the compliance history of sources that want to trade.[93] However, this leaves important ques-

> soil and associated nutrients while simultaneously controlling nonpoint pollution to provide good overall upland management.

Id.

In Florida, BMPs for agriculture "means conservation practices established by the U.S. Department of Agriculture's Soil Conservation Service for the purpose of reducing pollution from agricultural activities as applied to local conditions as set forth in 'A Manual of Reference Management Practices for Agricultural Activities,' Florida Department of Environmental Regulation, November 1978." *Id.* at 40A-44.021(1).

90. This type of monitoring should not be confused with monitoring *in* water bodies into which NPS pollution from an area empties. Such monitoring is critical and commentators have lamented that not enough of it exists. *Cf.* Williams, *supra* note 3, at 112-13 (suggesting present system creates unevenly allocated cleanup responsibilities and leads to finger pointing).

91. For example, EPA noted that, "due to extreme weather conditions or other circumstances that are beyond the control of the [nonpoint] source," a failure to create credits might occur. *See* EPA TRADING POLICY, *supra* note 6, at III.G.5. While EPA recommends that states and tribes include provisions to account for such events, EPA did not specify how. *See id.* Probably the strongest argument is that EPA envisions appropriate BMPs as compliance regardless of what occurs. This seems supported by language noting that credits are created as long as "management practices are functioning as expected." *Id.* at III.G.3. The case for monitoring is weaker and would depend on the fact that EPA suggests monitoring as one way of dealing with the uncertainty of NPS load reductions. *Id.* at III.G.4.

92. Schultz & Small, *supra* note 4, at 396 (discussing possibility of diminished enthusiasm for trading programs).

93. EPA TRADING POLICY, *supra* note 6, at III.G.5 (suggesting mechanisms for determining and ensuring compliance may include record keeping, monitoring, reporting and inspections).

tions unanswered. For example, assuming that the trade involves use of a private contract,[94] what should the legal remedy be if someone sells a credit that does not result in improvement in water quality? One approach is to have the seller accept the regulatory burden—i.e., the sanction for failure to comply with the permit—of the buyer if the credit sold is not produced by the seller.[95] Another option would allow the buyer to give the seller a loan that can be paid back with credits; if the credits are not produced, the loan becomes due with interest.[96] Some trading programs have recommended contractual obligations, including land purchases or easements, to ensure compliance and water quality improvements through land management programs.[97]

E. Transaction Costs and Trading Ratios

The uncertainties and difficulties involved in a trading program do not come cheaply. Administrative and transaction costs involved in trading programs can be substantial due to the complexities of calculating and tracking trades,[98] especially when the

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94. Use of private contracts is advocated by EPA if they are used in conjunction with legislation, rule making, and other legal mechanisms. *Id.* at III.G.1. Private contracts form part of a pilot project in Idaho. *See* BOISE RIVER TRADING, *supra* note 82, at 7.

95. FERTILE GROUND, *supra* note 11, at 41. This and the following examples assume that a point source buyer's NPDES permit would allow compliance with permit limits by trading. *See supra* notes 80-84 and accompanying text.

96. FERTILE GROUND, *supra* note 11, at 41. However, if the buyer has now come under enforcement action for violation of a NPDES permit due to the seller's failure to produce the credit purchased, it is unlikely that the buyer would be satisfied to simply get back the purchase price plus interest. Even were the buyer satisfied with this arrangement, water quality still loses in such a scenario if credits contracted for are not produced.

97. *See, e.g., Case Study: Minnesota, supra* note 71, at Part VII (malting company satisfied TMDL requirements by accepting restricted conditions on its wastewater and reducing upstream loading by equal amount).

98. For the seminal discussion of the importance of transaction costs, *see generally* Coase, *supra* note 20. For treatments specifically related to water quality trading, see FERTILE GROUND, *supra* note 11, at 16 (noting that some trading programs make trading prohibitive since programs increase administrative and transaction costs). *See also* U.S. EXPERIENCE, *supra* note 16, at V (noting that high transaction costs can especially be problematic in open (uncapped) trading systems); *see also id.* at 20 ("[L]iterature . . . predicts large, potential savings. Available evidence on actual achievements, however, points to relatively modest savings from most of the programs. In searching for the reasons for why such a large gap exists . . . , Stavins (2000) identifies transaction costs as the primary culprit."); *see also* Schultz & Small, *supra* note 4, at 380 (noting complexity of administrative and informational requisites); *see also id.* at 386 (discussing conflicts of interest between principals and agents that may impede pollution sources from trading); *see also* Powers, *supra* note 25, at 211-12, 215 (noting that programs become increasingly difficult and expensive as they become more complex).

program focuses on environmental improvement.[99] Administrative costs, however, must form part of the consideration of how to value any benefit associated with trading,[100] as such costs are likely to get underestimated in policy analysis[101] and are typically much higher than initially contemplated.[102] In fact, administrative costs of trading, including monitoring, tracking, and accounting, can go beyond the budgets of some states.[103] Unfortunately, the greater the amount of detail put into a trading program to make it more accurately reflect the complexities of reality, the higher the administrative and transaction costs.[104] The use of detailed trading ratios exemplifies problems of complexity and administrative cost.

Trading programs utilize trading ratios[105] to account for uncertainties inherent in the use of NPS controls to reduce loading.[106] For example, in agricultural NPS pollution, concern with sedimentation means that instead of only estimating the total amount of erosion occurring on a parcel of land, the amount of that erosion that actually reaches a waterway as sediment must also be estimated.[107] The ratios in such a case are known as delivery rates or

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99. *See* Richard T. Woodward, Ronald A. Kaiser, & Aaron-Marie Wicks, *The Structure and Practice of Water-Quality Trading Markets*, 38 JOURNAL OF THE AMERICAN WATER RESOURCES ASSOCIATION 967 (2002), *available at* http://ageco.tamu.edu/faculty/woodward/paps/structures.pdf [hereinafter *Structure and Practice*] ("[R]ules that are put in place to ensure environmental efficacy frequently lead to less efficient markets by increasing transaction costs or decreasing flexibility.").

100. Blacklocke, *supra* note 63, at 214 (conducting cost-benefit analysis of performance of water pollution trading program).

101. *Id.* at 215 (explaining how administrative costs tend to be underestimated when evaluating benefits and costs of trading policy).

102. *See* Powers, *supra* note 25, at 215 (adding that possibility of environmental impacts also raises administrative costs).

103. *Aftershock and Prelude, supra* note 56, at 10,399-10,400 (identifying cost as significant difficulty of trading schemes).

104. *See Structure and Practice, supra* note 99, at 976-86 (providing examples of increased transaction costs); *see also* Powers, *supra* note 25, at 215 (explaining negative aspects of utilizing trading ratios). The same is true of adding too much flexibility to a trading program. *Cf.* STEINZOR TESTIMONY, *supra* note 42 (noting that one lesson from EPA's XL program was that one cannot make program too flexible or open-ended since resulting vagueness and flexibility can lead to hopeless wrangling which effectively raises transaction costs to levels that exceed what is saved).

105. *See, e.g.*, Schultz & Small, *supra* note 4, at 382 (explaining trading ratios); *see also* BOISE RIVER TRADING, *supra* note 82, at 12-14 (describing trading system using ratios).

106. *See* BOISE RIVER TRADING, *supra* note 82, at 12-14 (using "uncertainty discount" for NPS calculations); *see also* Schultz & Small, *supra* note 4, at 382, 396 (explaining how ratios are used to account for uncertainties).

107. FERTILE GROUND, *supra* note 11, at 29 (explaining need to also estimate amounts).

sediment delivery ratios.[108] The additional administrative procedures and measurements required to calculate delivery rates make the trading ratio more complex and difficult to manage. The resulting increase in administrative costs diminishes the cost savings that might accrue from trading.

F. Creating Value for Pollution Credits

One other potential problem is the need to create value for trading credits. If no one needs to purchase credits, then the credits lack value and private parties will not invest in water quality improvements just to create worthless or low-value credits. A fully open trading system[109] appears to have the most problems creating value for credits because the lack of a limit on pollution increases means that existing and potential sources have less need for credits. The opposite of this appears in a fully closed system in which all possible sources of pollution must meet strict limits; fully closed systems are exceptionally rare because they require imposing enforceable limits on NPSs as well as PSs.[110]

Typically, value for credits is created by requiring pollution reductions from or placing stringent limits on pollutant loadings from sources already subject to regulatory authority.[111] While such a system could be either an open or closed system, both effectively force PSs subject to regulatory authority to either reduce their own

108. *Id.* (explaining ratio method for soil deposits). Related observations recur through many sources. *See, e.g.*, Schultz & Small, *supra* note 4, at 392.

109. *See* U.S. Experience, *supra* note 16, at 67 (explaining differences between "capped" and "uncapped" trading systems).

110. The best example of which the author is aware that comes close to fitting this description is the Lake Okeechobee Protection Program outlined in Florida Statutes 373.4595 (2002). The law says that "[w]here agricultural nonpoint source best management practices or interim measures have been adopted by rule . . . the owner or operator of an agricultural nonpoint source addressed by such rule shall either implement interim measures or best management practices or demonstrate compliance with the district's WOD program by conducting monitoring prescribed by the department or district." FLA. STAT. ch. 373.4595 (2002). Thus, while not directly imposing specific numerical limits, regulations require use of BMPs by agriculture. *Id.*

111. *See, e.g.*, Riggs, *supra* note 24, at 196 (noting that for trading programs to work, those contributing to pollution must see that binding constraint exists before they will participate in trading program); *see also* Powers, *supra* note 25, at 214 (suggesting successful pollutant trading program should have stringent limitations on pollution loading to serve as market driver).

pollution or fund reductions by NPSs.[112] The Tar-Pamlico Basin[113] and part of the Saginaw Bay project in Wisconsin[114] serve as examples of this approach.[115] While some advocate this approach as a reasonable and effective way to fund NPS abatement,[116] others have asked if it is fair to force PSs to pay for pollution reduction by NPSs simply because existing regulatory authority makes it easier than forcing NPSs to pay.[117] In addition to these difficult equity and distributive questions, who pays for NPS reductions also implicates efficiency concerns.

VI. Economic Analysis: Distributional Concerns and Efficiency

The fact that incentive-based approaches such as trading have not received greater acceptance and more use may stem partly from the fact that they can result in distributional changes as to who pays

112. In the open system version, a cap exists on the individual NPDES permits of the PSs and provisions would allow the PSs to comply with the permit by securing load reductions from NPSs. In the closed version, an overall cap would be placed on the total amount of pollution, virtually forcing the PS to evaluate if it would be cheaper for the PS to install new equipment or pay for reductions by NPSs. In either scenario, the PSs are still forced to either reduce their own loading or secure reductions by NPSs since the bulk of NPSs are not subject to such regulation. *See, e.g.*, Steinzor Testimony, *supra* note 42 (advocating strict caps on sources to create "adequate scarcity of marketable allowances to ensure that trading remains economically attractive"). As long as NPSs are largely free from regulatory constraints, any creation of scarcity of marketable allowances will have to be created by reducing the amount that regulated—i.e. point—sources can discharge.

113. North Carolina Nonpoint Source Management Program, North Carolina Department Of Environment and Natural Resources, Phase I: Point Source – Nonpoint Source Nutrient Trading Program, *at* http://h2o.enr.state.nc.us/nps/tarpam.htm#phase1 (last modified Feb. 10, 2002) (describing Tar-Pamlico strategy to reduce nutrient input to estuary).

114. Fertile Ground, *supra* note 11, at 21 (noting that PSs formed partnership and assessed themselves fees in order to undertake study and monitoring of their hydrologic basin and to petition for extension on regulations in order to give them time to study trading program).

115. *See Aftershock and Prelude*, *supra* note 56, at 10,402 (noting that while industry point sources have typically funded their own pollution abatement, NPSs, even when including some of country's largest corporations, have largely been paid for by government).

116. Steinzor Testimony, *supra* note 42. Steinzor asserts that because government organizations lack funds, PSs should pay the overhead for trading since PSs benefit from these programs. *Id.* However, this ignores the fact that any "benefit" to the PSs of decreased regulatory compliance cost only results from the fact that NPSs can more cheaply reduce pollution because the NPSs have not, like the rest of the industry, been forced to reduce their most blatant and easily controlled pollution. *Id.*

117. Fertile Ground, *supra* note 11, at 37 (positing that regulating PSs is politically easiest route).

the bills and who benefits.[118] While much analysis has focused on the efficiency and cost-saving[119] expected to occur as a result of water quality trading programs, much less time has been devoted to issues of equity lurking in the implementation of water quality trading.[120] Indeed, it has been noted that since the field of law and economics has been influencing legal policy, it has focused almost exclusively on "efficiency" or the "simple sum of the costs and benefits that they impose on the population without regard to how those costs and benefits are distributed among different individuals."[121] Yet any change in policy unavoidably implicates distributional concerns.[122] Expanding this rationale, one observes that even the status quo regulatory framework implies certain distributive effects, which, in turn, affect how different groups view potential changes.[123] Because the idea that economics can be neutral with regards to distributive effects is mistaken,[124] a distributional analysis

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118. Robert V. Percival, Alan S. Miller, Christopher Schroeder & James P. Leape, ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY, 174-76 (3d ed., 2000) (describing economic incentive approach to regulation).

119. In this context, I am using "efficiency" to mean achieving maximum water quality improvement/pollution abatement for the least possible cost. U.S. EXPERIENCE, *supra* note 16, at 2 ("To achieve maximum cost effectiveness, each source should control pollution to the point where the last units of pollution cost the same amount to control at each source."). This is different from the way an economist would define efficiency. *See id.* "To achieve efficiency, the situation that maximizes the difference between benefits and costs, pollution should be controlled until the per-unit costs of controlling pollution that are faced by each source are equal to the incremental value of damage to health and the environment caused by that pollution." *Id.* While this latter approach might be preferable, it is virtually impossible to apply accurately under actual conditions and is more an academic or theoretical exercise. *Id.* Our goal should be to get as close to the latter definition as possible and then to reduce to that point in the least-cost manner possible.

120. *See* Schultz & Small, *supra* note 4, at 381 (observing that water quality trading solution to water impairment "ignores concerns about whether the resulting distribution of costs is equitable"). *Cf.* J.B. Ruhl, *Farmland Stewardship: Can Ecosystems Stand Any More of It?*, 9 WASH. U. J.L. & POL'Y 1, 16 (2002) (noting equity now demands that we demand pollution reductions from agriculture in order to improve water quality) [hereinafter *Farmland Stewardship*].

121. Chris William Sanchirico, *Deconstructing the New Efficiency Rationale*, 86 CORNELL L. REV. 1003, 1005 (2001). The footnote to the cited text gives a list of articles for a review of various concepts of efficiency. *Id.* at 1005, n.1. The author also notes that some writers, such as Bruce Ackerman, Jennifer H. Arlen, and Guido Calabresi, among others, have actually considered distributional effects in their analyses.

122. *See* Guido Calabresi, *The Pointlessness of Pareto: Carrying Coase Further*, 100 YALE L.J. 1211, 1212, 1215 (1991) (explaining effect of transaction costs).

123. *Id.* at 1214, 1227-28 (discussing symmetry between market and command systems).

124. *Id.* at 1227 (noting that interpersonal comparisons in economics can no longer be ignored; there are winners and losers in every transaction).

should be included in the decision-making processes and any assumptions should be made explicit.[125] This Part addresses current assumptions and distributive impacts of the treatment of agricultural NPS pollution and how these should affect establishment of baselines for trading programs and regulation of agricultural NPS pollution.

A. Establishing a Baseline

EPA has made clear that trading credits only result from reductions beyond those already required by law.[126] Thus, existing legal requirements for pollution control form the baseline for creation of credits for trading. If a TMDL has not been established in an area, the relevant legal requirements for PSs usually only include NPDES permits, which establish the baseline waste load.[127] This makes the issue of where the baseline is for those with NPDES permits relatively simple.[128]

Establishing a baseline for agricultural NPSs presents greater difficulties. If a TMDL has already been established, the load allocations for NPSs comprise the baseline. This demonstrates the importance of establishing the baseline or load allocation in a TMDL. At this point in the analysis, establishing a load allocation for a TMDL and a baseline for a trading program where a TMDL has not been established are functionally the same; in either case, since monitoring of actual NPS loading rarely takes place, modeling typically serves to establish the loading of NPSs. In addition to the problems with modeling that were noted earlier,[129] the question becomes what should be modeled. Should the actual practices of individual NPSs be modeled? Or should the actual current loadings of a specific type of land use that contributes to NPS pollution

125. *Id.* at 1228 (discussing benefits of distributional analysis on policymaking).

126. EPA TRADING POLICY, *supra* note 6, at III.D (providing definition and examples of reduction credits).

127. CWA does not give federal authority over most NPS pollution. Williams, *supra* note 3, at 90-91. Thus, the usual determinant of regulatory authority over NPSs depends on state law. *Environmental Law of Farms, supra* note 13, at notes 124-26 and accompanying text. The Environmental Law Institute concluded after a survey of states that few states have much regulatory control over agricultural NPS pollution. ENVIRONMENTAL LAW INSTITUTE, ENFORCEABLE STATE MECHANISMS FOR THE CONTROL OF NONPOINT SOURCE WATER POLLUTION (1997); ENVIRONMENTAL LAW INSTITUTE, RESEARCH REPORT: ALMANAC OF ENFORCEABLE STATE LAWS TO CONTROL NONPOINT SOURCE WATER POLLUTION (1998).

128. *See Environmental Law of Farms, supra* note 13, 113-19 and accompanying text (noting how TMDLs impact water bodies).

129. *See supra* notes 68-79 and accompanying text.

be modeled? If the latter, should the total then be prorated according to acres owned or managed by individual NPSs?

Modeling each individual NPS and assigning an allocation based on current loadings appears to be the worst option.[130] If a baseline is established simply by reducing all current agricultural NPS loadings by the same percentage until the needed levels of reduction are reached, those farmers who previously loaded the most receive the advantage of a higher baseline even if their overall amount of reductions is larger. The same farmer has the additional advantage of now using the cheapest and easiest BMPs to reduce loading *because* they were not in use before. This effectively punishes a good steward who has been using methods to control or prevent pollution. The good steward will probably not have the advantage of the easiest pollution-abatement BMPs since they were likely already in use. In addition to this obstacle, the good steward will also have to reduce pollution to a much lower level than a notorious polluter *because the good steward had already reduced pollution.* Thus, such a steward has less ability to create credits for sale despite having been a good steward of the land on a voluntary basis before getting paid to do so. Meanwhile, an NPS polluter who has taken no abatement measures would have the cheapest and easiest abatement measures still available to implement to create credits. Thus, exclusive or substantial reliance on current individual loadings as a baseline punishes the good, rewards the bad, and further encourages agriculture to continue externalizing its pollution costs.

In contrast to modeling individual NPSs, some states have chosen to allocate to NPSs based solely on aggregates of land use within a basin.[131] EPA adopted this approach in its policy on trading.[132] This allows each type of land use in a watershed to work together as

130. *See* DIV. OF ASSESSMENT AND STANDARDS, PENNSYLVANIA DEP'T OF ENVTL. RESOURCES, EQUAL MARGINAL PERCENT REDUCTION WASTELOAD ALLOCATION POLICY (1987) (providing description of how to model each individual NPS).

131. *E.g.*, Telephone interview with Ron McBride, TMDL Coordinator, Washington Department of Environmental Quality (June 24, 2002) (discussing various states' approaches to dealing with NPSs pollution); *see also* REPORT TO THE GOVERNOR, *supra* note 66 (assigning allocations to NPDES permit holders and "general allocations to level of major categories of nonpoint sources"). This approach acknowledges the reality that many NPSs are subject to little or no regulatory authority and that the actions of these pollution sources can only be affected by incentives and voluntary actions. Assigning load allocations to individual NPSs is viewed as too threatening an action, which impedes getting the voluntary cooperation of the NPSs involved in the pollution problem. Thus, securing voluntary cooperation is best served by keeping NPS allocations at the most general level possible.

132. EPA TRADING POLICY, *supra* note 6, at III.D (discussing baselines for water quality trading).

a group. Working with a familiar representative or agency should allow the group more involvement and control in the process.[133] This approach does not punish good stewards because the allocation or baseline is based on an aggregate loading by agriculture or other land use; a good steward will get an allocation similar to that of a highly-polluting farmer if the aggregate allocation is individually prorated according to the amount of land owned or managed by an NPS pollution source. While some minor problems with the aggregate baseline or allocation can be overcome by other provisions in a trading program,[134] this approach still rewards agriculture in general for remaining free of regulatory controls. The reward comes in the form of a higher baseline for credit creation compared to the average level of existing agricultural NPS pollution.

Another approach for establishing a trading baseline is to model the loading for agricultural NPSs as if all agriculture in the watershed were utilizing specified BMPs to avoid NPS pollution. This approach does not punish those already utilizing BMPs since they now have the same ability to create credits as those who did not use BMPs. At the same time, this system would place the greatest burden for reductions on those using farming methods that pollute the most.

This raises yet another complicating factor in that those farmers using practices that tend to cause the most pollution may or may not be the farmers causing the worst agricultural pollution problem depending on the position of the farmers relative to the water body that receives the agricultural pollution. As noted earlier, erosion taking place in a field or at the edge of a field may differ dramatically from the amount of sediment from that field's erosion that actually ends up in a water body.[135] The same holds true for agricultural NPS pollution in general. The ability of a trading program with delivery ratios to focus on such differences

133. *See* REPORT TO THE GOVERNOR, *supra* note 66, at § 1.5, tbl.4 (explaining how groups can gain more input into trading policy process and noting members of technical advisory committee).

134. Such an approach does not address the critical factor of how close the source of pollution is to a water body and thus how much pollutant produced by the source actually arrives in the water affected. *See supra* notes 105-08 and accompanying text (discussing use of trading ratios). This weakness can, however, be overcome by implementing trading ratios that use delivery ratios to account for proximity to water. *Id.*

135. *See id.*

through market incentives comprises the real genius and appeal of trading.[136]

Establishing a baseline founded on assumed BMP usage would, however, undermine the potential cost savings of trading because the BMPs will include the cheapest and easiest management techniques for reducing agricultural NPS pollution.[137] Further reductions below specified BMPs would then presumably cost more to implement and thus reduce the marginal cost differential between NPS and PS reductions that is so crucial to the success of a trading program.[138] While agriculture might portray the imposition of BMPs as unfair,[139] it should be acknowledged that the considerable marginal cost differences for reductions between PSs and NPSs exist because agriculture, unlike industry, has seldom had to control its pollution.[140]

B. Efficiency Considerations

Externalization of agriculture's pollution costs leads not only to distributional concerns, but also to efficiency concerns.[141] Conventional economic analysis makes farming practices that exter-

136. *See* Boise River Trading, *supra* note 82 (providing excellent example of pilot trading program that implements these factors).

137. *Cf.* Report to the Governor, *supra* note 66, at 3.1 (stating BMP "refers to a practice or combination of practices that, based on sound science and best professional judgment, are determined to be the *most effective and practicable means* of reducing nonpoint source pollution and improving water quality. Both *economic* and technological considerations are included in the evaluation of what is practicable." (emphasis added)). "[T]he BMP development process should take into account the economic resources available and the feasibility of the management measures." *Id.* at 4.1.1. "BMPs take economic constraints into account." *Id.* at 4.2.3.

138. *See supra* notes 18-19 and accompanying text (discussing factors in cost analysis and impact of reductions in NPSs).

139. *E.g.*, Williams, *supra* note 3, at 28 (noting farmers may view any "'baseline' shift . . . that implicitly assign [sic] entitlements to cleaner water to citizens" as unfair).

140. *See id.* at 25 (noting need for more federal regulation for agricultural pollution). *Cf. also* Report to the Governor, *supra* note 66, at 4.1.1 (noting that "traditional point sources are required to provide, at a minimum, Best Available Technology Economically Achievable (BAT)," and that therefore, nonpoint sources of pollution, "especially those not subject to Florida's stormwater or environmental resource permits," should be expected to provide, at minimum, comparable levels of treatment).

141. The concept of internalizing costs forms an inherent part of the "polluter pays principle." *See, e.g.*, David Hunter et al., Center for International Environmental Law Concepts and Principles of International Environmental Law: An Introduction 32-33 (1994) (citing Principle 16 of Rio Declaration, providing that "national authorities should endeavor to promote the internalization of environmental costs . . . taking into account the approach that the polluter should, in principle, bear the cost of pollution").

nalize costs to the environment look more efficient than those practices that reduce impacts on the environment.[142] Accounting for externalized costs and inputting them into the analysis allows conservation-type farming methods to compete economically.[143] Current agricultural policy in the United States, by virtue of its non-regulation of agricultural NPSs, largely allows agriculture to externalize its pollution costs to the detriment of the competitiveness of conservation-based agriculture. Farm policy often works against stewardship-oriented farmers,[144] and subsidy programs often promote environmental harm.[145] Economic analysis even shows that agricultural subsidy programs aimed at improving the environment often fail to efficiently address environmental concerns.[146]

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142. WORLD RESOURCES INSTITUTE, AGRICULTURAL POLICY AND SUSTAINABILITY: CASE STUDIES FROM INDIA, THE PHILIPPINES AND THE UNITED STATES viii (Paul Faeth ed., 1993) [hereinafter WORLD RESOURCES INSTITUTE] (noting theme emerging in study).

143. *Id.* (noting affect of including natural resource base in calculation of farm income).

144. *Id.* at 10 (discussing Pennsylvania farm study).

145. U.S. EXPERIENCE, *supra* note 16, at 141.

> The effect of the price support program for sugar on the Florida Everglades is frequently cited as an example of an environmentally harmful subsidy. The federal government subsidizes the sugar industry by guaranteeing a floor price of $0.18 per pound, which is almost twice the price on world markets. This U.S. policy is further supported by tariffs of $0.16 per pound on imported sugar that is in excess of quota levels. In 1992, this support program resulted in $161.5 million in benefits for sugarcane farmers and $107.7 million for processors. This increases the amount of water diverted to sugarcane fields as well as the amount of runoff. The diversion and the runoff, which is contaminated with pesticides and fertilizers that sugarcane growers apply to maximize production, damage the ecosystem of the Everglades. Agricultural subsidies appear to be having similar adverse effects elsewhere in the United States.

Id. Eleven years later, sugarcane production in the United States continues to receive enormous subsidies in the form of price supports; for the effect of these subsidies on the price of sugar, one only need look to the *Wall Street Journal.* On November 20, 2003, the *Wall Street Journal* listed the futures prices of sugar on the world market between 6.29 cents per pound and 6.44 cents per pound. A separate listing gives the "domestic" sugar futures prices as ranging between 20.75 cents per pound to 21.45 cents per pound. WALL ST. J., Nov. 20, 2003, at C14. One can hardly be faulted for asking why we permit our government to spend millions and millions of dollars to subsidize sugar production that harms the Everglades and raises the price of sugar.

146. Paul Faeth, THE WORLD RESOURCES INSTITUTE, GROWING GREENER: ENHANCING THE ECONOMIC AND ENVIRONMENTAL PERFORMANCE OF U.S. AGRICULTURE 28 (1995) (showing Conservation Reserve Program, in table 2-6, is aimed at reducing soil erosion and yet has highest enrollment in areas with lowest offsite soil erosion problems while area with greatest soil erosion has lowest enrollment). *Cf.* Williams, *supra* note 3, at 108 (noting amount of money spent on Conservation Reserve Program (CRP)—$1.7 billion— amounts to almost half of all federal conservation spending).

While the efficiency of cost internalization dictates that agriculture should shoulder its costs to abate its pollution as we have required of other industries and activities,[147] policy regarding agriculture and the environment should, at a minimum, not be structured in a way that promotes environmental harm. Our policy should also avoid hurting small producers and those who have voluntarily reduced their pollution.[148] Otherwise the policy inadvertently sends the message that the best stewards of the land get punished for their naïveté in doing the "right" thing, while those who insisted on payment to not pollute get the advantage.[149]

VII. ISSUES WITH STATE LAWS

During the design of trading programs, consideration of federal law and the CWA must be augmented by examination of state laws. Some state laws and regulations protecting water and controlling agriculture are much broader in scope and stricter than federal regulations.[150] In addition to schemes that regulate more activities and areas, some state laws contain requirements that efforts to control or reduce pollution must occur with careful consideration of

147. If U.S. farmers internalized pollution cost, then they would not be able to compete in the international market. *Environmental Law of Farms*, *supra* note 13, at text preceding note 58; *see also id.* at notes 259-60 and accompanying text (noting that "international trade policy must be changed to eliminate the concern that further financial burdens on U.S. farmers will put them at competitive disadvantages with less environmentally responsible countries"). Despite increased costs, it may be possible to harmonize free trade and agricultural support programs that focus on the system's environmental benefits. WORLD RESOURCES INSTITUTE, *supra* note 142, at 12. The increased food cost argument fails to consider that in 1997, U.S. farms captured only seven cents of each dollar that a consumer spent on their farm products in a grocery store. Brian Halweil, The Worldwatch Institute, *Farming in the Public Interest*, *in* STATE OF THE WORLD 2002, at 56 (2002). Thus, a modest increase in the costs of farm commodities would have a minimal effect on the prices the consumer pays since ninety-three percent of consumer costs go to food processors, food marketers, and agricultural input suppliers. *Cf. id.*

148. *See* Kershen, *supra* note 4, at 7, 65 (stating current statute financially rewards farmers and ranchers who are not environmentally conscious on their land). For the importance of phasing out counterproductive subsidies in the environmental field before engaging in further regulation, see Carol M. Rose, *Property Rights and Responsibilities*, THINKING ECOLOGICALLY 49, 56 (Marian R. Chertow & Daniel C. Esty eds., 1997).

149. *Cf.* Garrett Hardin, *Tragedy of the Commons*, 162 SCIENCE 1243-48 (1968) (applying tragedy of commons concept to pollution).

150. *See, e.g.*, Kentucky Agriculture Water Quality Act, KY. REV. STAT. ANN. §§ 224.71-100 to-140 (Banks-Baldwin 1999) (requiring any agricultural operation over ten contiguous acres of land to develop and implement water quality plan based on BMPs). For a comprehensive overview of enforceable state laws pertaining to NPS pollution, see ENVIRONMENTAL LAW INSTITUTE, ALMANAC OF ENFORCEABLE STATE LAWS TO CONTROL NONPOINT SOURCE WATER POLLUTION (1998), http://www.elistore.org/data/products/d8.07.pdf.

the equitable outcomes that may result.[151] This Part uses the laws and regulations of Florida to illustrate the importance of a legal requirement to consider equity in pollution abatement. Of course, many of the points about equity raised by the following discussion have logical force independent of a legal state requirement to consider equitable issues.

In Florida, as in many states, "[n]onpoint source (NPS) pollution is the largest contributor of pollutants to . . . surface and ground waters."[152] Trading has been advocated in Florida as a way to deal with this problem.[153] Furthermore, Florida statutes allow trading programs to serve as a way to avoid the need to establish TMDLs.[154]

151. At least two states have statutory language indicating that pollution abatement must take into account equitable considerations. *See* ARIZ. REV. STAT. § 49-231(3); FLA. STAT. ch. 403.067(1) (2002). "The scientifically based total maximum daily load program is necessary to fairly and equitably allocate pollution loads to both nonpoint and point sources." FLA. STAT. ch. 403.067(1).

152. FLORIDA NONPOINT SOURCE MANAGEMENT PROGRAM UPDATE (Nov. 1999), *available at* http://www.dep.state.fl.us/water/nonpoint/pubs.htm. The Florida Administrative Code, like federal regulations, exempts almost all agriculture from the definition of point source. FLA. ADMIN. CODE r. 62-620.200(35). "'Point source' means any discernible, confined, and discrete conveyance, including any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. *This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.*" *Id.* (emphasis added).

153. *E.g.*, FLA. STAT. ch. 403.067(7)(a) (2002) (showing that DEP controls maximum daily loads through water quality protection programs); *see also* REPORT TO THE GOVERNOR, *supra* note 66, at § 4.1.3 (noting potential for water quality trading).

154. FLA STAT. ch. 403.067(4) (2002). This statute states that TMDLs will only need to be established if water quality standards are not being met and "other pollution control programs . . . are not sufficient to result in attainment of applicable surface water quality standards." *Id.* If a trading program could be deemed "sufficient to result in attainment," then a TMDL need not be established. *Id.* While the text of the TMDL program in § 303(d) of the CWA (33 U.S.C. § 1313(d)) does not expressly provide such a potential escape hatch from establishing a TMDL, federal regulations do have a somewhat similar provision. 40 C.F.R. § 130.7(b)(1)(iii) (2002). This section of the Code of Federal Regulations requires the identification of water quality limited segments needing a TMDL where "other pollution control requirements (e.g., best management practices) required by local, State, or Federal authority are not stringent enough to implement any water quality standards (WQS) applicable to such waters." *Id.* One might, as Florida has done, interpret this regulation to mean that TMDLs need not be developed where some assurance of meeting water quality standards exists. Note, however, that the federal regulations refer to "pollution control requirements," not "assurances." *See id.* This implies that voluntary programs not subject to enforcement should not suffice under federal regulations, and a simple state policy of designing BMPs and aiding with voluntary implementation or designing a voluntary trading program should not be construed to fulfill federal regulatory

As noted above, since a baseline for trading and a baseline for TMDL allocations appear analogous, Florida's approach to TMDL allocation seems particularly relevant.[155] Florida statutes require that TMDLs "shall include establishment of reasonable and equitable allocations of the total maximum daily load among point and nonpoint sources."[156] Furthermore, allocations should consider the following: existing treatment and management practices; differing impacts pollutants may have on water quality; the availability of treatment technologies and management practices; environmental, economic, and technological feasibility of achieving the allocation; and the cost-benefit associated with achieving the allocation.[157]

This long list of factors effectively allowed the Florida legislature to avoid making the most difficult and detailed determinations regarding allocations.[158] A report on allocation strategies for TMDLs,[159] however, did note that TMDL allocations for NPSs should be premised on NPSs being subjected to BMPs as the NPS equivalent of best available technology (BAT)[160] for PSs.[161] This, said the report, would constitute the first step toward equity by "leveling the playing field" between PSs and NPSs before requiring any additional pollution reductions from PSs.[162]

This means that a trading program operating under a TMDL cap in Florida cannot base allocations between PSs and NPSs on the current actual loadings of individual NPSs. It also appears that in

requirements for exemption from establishing a TMDL in a water which otherwise requires one according to 33 U.S.C. § 1313(d)(1)(A) (2001).

155. *See supra* notes 125-29 and accompanying text (describing establishment of baseline).

156. FLA. STAT. ch. 403.067(6)(b) (2002) (showing such allocations may determine maximum amount of water pollutant from given source).

157. FLA. STAT. ch. 403.067(6)(b)(1-6) (2002) (citing consideration for allocating daily loads).

158. REPORT TO THE GOVERNOR, *supra* note 66, at § 4.1.1 (noting that technical advisory committee writing report "developed recommendations for expanding upon the legislative direction to provide for a 'reasonable and equitable' allocation of a TMDL.").

159. *Id.* FL. STAT. ch. 403.067(6)(b)(1999) (requiring this report).

160. *See* 33 U.S.C. § 1314(b)(2)(B) (2001). "[A]ssessment of best available technology shall take into account the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate." *Id.*

161. *See* REPORT TO THE GOVERNOR, *supra* note 66, at § 4.1.1; *see also Aftershock and Prelude, supra* note 56, at n.459 (noting that technology controls have been critical in success of CWA and that to seriously clean up agricultural water pollution, we need to subject agriculture to its own form of BATs).

162. REPORT TO THE GOVERNOR, *supra* note 66, at § 4.1.1.

most instances[163] a trading program could not even follow the suggestion of EPA to establish baselines according to "the level of pollutant load associated with existing land uses and management practices that comply with applicable state, local, or tribal regulations"[164] since to do so would not be "reasonable and equitable" unless all agriculture in the area of concern had already implemented BMPs. Considering that the law requiring reasonable and equitable allocation only applies to TMDLs, this leaves the question as to whether a *trading* program in Florida could still use current individual NPS loadings or current aggregate land-use category loadings as the measure of baseline to create trading credits. Clearly such an approach would conflict with the acknowledgment that PSs have long been forced to internalize costs that agriculture has continued to externalize. The similarity of establishing a baseline for TMDL allocations and a baseline for trading indicates that the same argument regarding "leveling the playing field" should logically apply to a baseline for creating tradable credits as much as it applies to TMDL allocations. Furthermore, allowing current individual loadings to establish baselines for trading would reward polluters and punish the best agricultural stewards.[165] Thus, state law in Florida implies that a baseline for creating trading credits should assume implementation of agricultural BMPs in order to further equitable considerations.

While some assert that it makes little sense to talk about technological controls on NPSs,[166] imposing BMPs on agriculture has the potential to accomplish as much pollution reduction for NPSs as imposing BAT on PSs has accomplished.[167] Professor J.B. Ruhl makes an excellent case that regulations could be limited to the "agro-industrial farm operations" which are "low-hanging fruit ripe for the picking," as represented by the largest factory and industrial

163. *See id.* (designating instances in which BMPs have not been required of agriculture).

164. EPA TRADING POLICY, *supra* note 6 (describing baselines for water quality trading).

165. *See supra* note 130 and accompanying text.

166. Andrew P. Morriss, Bruce Yandle & Roger E. Meiners, *The Failure of EPA's Water Quality Reforms: From Environment-Enhancing Competition to Uniformity and Polluter Profits*, 20 UCLA J. ENVTL. L. & POL'Y 25, 46 (2001) (recognizing that NPSs are hard to pinpoint); *see also* Williams, *supra* note 3, at 27 (noting that "technology-based approach with uniform effluent limitations appear[s] quite fantastical"). *But cf.* Williams, *supra* note 3, at 59 (noting that today farmers are becoming "technology applicators" for agribusiness food chain).

167. *Aftershock and Prelude*, *supra* note 56, at 10,415 (explaining most pollution of NPSs is coming from agricultural sources); *see also* Kershen, *supra* note 4, at 6-7 (discussing programs utilizing BMPs).

farms,[168] while application of BMPs to most parts of the agricultural sector would be much more varied and flexible in accord with the differences in agriculture.[169] In particular, the imposition of BMPs could vary depending on the location and other attributes of an agricultural operation that, in conjunction with weather, determine the amount of actual pollution loading that results in the contemplated water body. This is commensurate with the idea of efficiency because it focuses the burden of reductions on those whose activities contribute the most pollution.

The problem remains that even if requiring BMPs would "level the playing field," BMPs to address NPS pollution are largely voluntary.[170] The Florida Department of Environmental Protection (DEP) emphasizes that the BMP manuals for agriculture are educational, not regulatory, documents.[171] While Florida water management districts have incorporated BMPs into their regulatory schemes by making them permit requirements,[172] this only makes BMPs mandatory in the limited circumstances under which an agricultural operation needs a permit.[173]

The fact that Florida occasionally demands BMPs of agriculture does not address all the economic analysis arguments

168. J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 ECOLOGY L.Q. 263, 335-36 (2000) (noting that if these agro-industrial farms are treated as industrialized operation, number of individual operations needing regulations is less and compliance cost is placed on operations that are most capable of passing those costs to consumer). Professor Houck cites to this same quote from Ruhl and notes that legal distinctions between large and small municipalities already exist. *Aftershock and Prelude, supra* note 56, at 445-47 and accompanying text.

169. *See* Williams, *supra* note 3, at 29 (noting that best approach to regulation is mix of strategies).

170. *Id.* at 71 (noting that lack of linkage makes it difficult to develop regulatory programs).

171. DEP [Florida Dept. of Envt'l Prot.] Nonpoint Source Management, *available at* http://www.dep.state.fl.us/water/nonpoint/pubs.htm (emphasizing educational nature of manuals).

172. *E.g.*, FLA. ADMIN. CODE r. 40E-63.136; *see also* FLA. ADMIN. CODE r. 40C-44.055 (noting that agricultural operations requiring permit qualify for general permit if operation has "Conservation Plan"). A "Conservation Plan" is "a document which describes a system of management practices to control and reduce soil erosion and sediment loss, and improve the quality of discharged water for a specific parcel of property, and which . . . includes and applies . . . the Best Management Practices Selector." FLA. ADMIN. CODE r. 40C-44.021(4).

173. FLORIDA NONPOINT SOURCE MANAGEMENT PROGRAM UPDATE 74 (Nov. 1999); *see also, e.g.*, FLA. ADMIN. CODE r. 40C-44.041(1)(a) (1995) (requiring permits in Apopka Basin for agricultural operations with surface water management system with total pump capacity of greater than 10,000 gallons per minute); *see also, e.g.*, FLA. ADMIN. CODE r. 40C-44.041(1)(b) (1995) (allowing water management district to require permits of any agricultural operation on case-by-case basis if operation causes or contributes to violation of state water quality standards).

presented here. The law still requires a state agency[174] to provide technical and financial assistance for implementation of BMPs.[175] This kind of agricultural subsidy still implicates fairness and efficiency concerns.[176] Is it fair to impose the costs for agriculture's pollution reductions on others? If answered affirmatively, does it subvert the supposed devotion to "free market" economics to support agricultural operations that could not survive in the market if forced to internalize the costs of dealing with their own pollution? These questions are difficult and, in all fairness, can be rephrased to imply contrary answers. For example: Should agricultural operations be forced out of business when the extra expense of environmental protection prevents agricultural operations from effectively competing with operations in countries with fewer environmental restrictions?[177]

Florida's efforts to tackle agricultural NPS pollution have, in some instances, put Florida in the lead on NPS pollution control by requiring BMPs of agriculture in large areas.[178] Nevertheless, much of the cost for water quality improvements has been externalized by agriculture. While it may not be reasonable in light of past history

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174. The Department of Agriculture and Consumer Affairs (DACS) is the agency responsible.

175. FLA. STAT. ANN. § 373.4595 (3)(c)(2)(b). *See generally Aftershock and Prelude, supra* note 56, at n.251-52 and accompanying text. "The state of Wisconsin is in the final stages of adopting rules imposing mandatory controls on nonpoint source runoff but require the state to provide 70% of the costs. The state of New York is providing over $14 million to farmers for runoff abatement, and the city of New York is kicking in another $10 million to protect its drinking water resources." *Id.* (footnotes omitted).

176. *See, e.g.*, FLA. STAT. ANN. § 373.461(5)(a) (2002) (noting that Florida has even, in some instances, decided that it is easier for state to buy land to take it out of agricultural production than to try to control pollution created by it by other means).

177. Assuming that increased environmental protection necessarily costs agricultural operations more than it saves them may not always be correct. Just as other industries have often noted savings after implementing measures designed to further environmental goals, agriculture should consider the tremendous cost involved in fertilizer application. Andrew Brengle, *Proving the Value of Environmental Management Systems*, 26 FLETCHER F. WORLD AFF. 205, 210 (2002) (noting tentative links between financial and environmental performance). Up to 40% of nitrogen and 60% of phosphorous applied to crops are not taken up by the crops. FERTILE GROUND, *supra* note 11, at 7 (citing to National Research Council analysis of nutrient use in United States). Since nitrogen and phosphorous cost farmers a tremendous amount to buy and apply, the savings potential could be substantial. Even if environmental protection could save agriculture money in some instances, this does not help if farmers do not realize it since even a mistaken belief that something would not make us all better off, still acts as a transaction cost that prevent change. Calabresi, *supra* note 122, at 1211.

178. *See supra* note 110 and accompanying text.

to suddenly heavily regulate farming,[179] we must insist that farming begin to internalize some of its own costs of pollution abatement.

Thus, generally-applicable performance requirements on agriculture should be implemented. These requirements could vary according to a number of factors, including soil, slope, climate, and crop,[180] and could be met by designing a plan choosing from a variety of available BMPs. Doing so would not punish the best stewards, as they would likely already be in compliance.[181] To accomplish this, however, would require new and direct regulatory authority over NPSs such as agriculture.

VIII. CONCLUSIONS AND RECOMMENDATIONS

Runoff from agriculture now constitutes one of our most serious water quality problems. The large contribution of agriculture to water pollution stems in part from the different regulatory treatment of agricultural NPSs compared to other sources of pollution under federal law.[182] Water quality trading presents many potential benefits in dealing with agricultural NPS pollution; chief among these is utilization of a market mechanism to focus pollution abatement dollars on the least-cost pollution-abatement activities. CWA's

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179. *See, e.g.*, J.B. Ruhl, *Agriculture and the Environment: Three Myths, Three Themes, Three Directions*, 25 ENVTL. L. & POL'Y J. 101, 105 (2002) (noting that farmers and consumers have relied on "benign neglect" of environmental law, and that this makes it less reasonable to suddenly and completely impose command-and-control regulation on industry). *See also* Rose, *supra* note 148 (noting that draconian restrictions for environmental purposes may not be appropriate when long-time usage and attitudes have encouraged substantial investment based on accepted practice).

180. *See, e.g.*, *Aftershock and Prelude*, *supra* note 56, 443-91 and accompanying text (citing to J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 ECOLOGY L.Q. 263, 333-37 (2000)).

181. FERTILE GROUND, *supra* note 11, at 40 (noting no adverse effect on those already in compliance).

182. *Compare* Miccosukee Tribe of Indians of Florida v. S. Florida Water Mgmt. Dist., 280 F.3d 1364, 1367-68 (11th Cir. 2002) (noting that discharges from pumping station are "point sources" which need NPDES permit under Clean Water Act even if pump station itself adds no pollution to water being pumped), *rehearing en banc denied*, 45 Fed. Appx. 880, 2002 WL 1424348 (11th Cir. 2002), *cert. granted*, 123 S. Ct. 2638 (2003), *with* Fishermen Against the Destruction of the Env't, Inc. v. Closter Farms, Inc., 300 F.3d 1294, 1297-98 (11th Cir. 2002) (exempting polluted discharges from pumping station into Lake Okeechobee because all water discharged was either covered by NPDES permit or fell under exemptions for agricultural return flows or agricultural stormwater runoff), *rehearing en banc denied*, 52 Fed. Appx. 489, 2002 WL 31415798 (11th Cir. 2002). *See also* Schultz & Small, *supra* note 4, at 385; 33 U.S.C. § 1313(d) (2000). The CWA may be able to affect NPS pollution through the TMDL provisions in section 303(d) of the CWA. *See* § 1313(d), *supra*. However, one must note that section 303(d) grants no direct federal authority to regulate NPSs. *See id.*

real goal, however, is clean water, not just economic efficiency to achieve less dirty water at a lower cost.[183] But even if least-cost pollution abatement was the focus of CWA, trading will not save as much money in practice as theory indicates.

First, while trading programs have resulted in water quality improvements, the improvements have seldom come from actual trades.[184] Rather, improvements in water quality in areas with pilot trading programs seem to come more from the influx of time, money, and concern for water quality in the area than actual trades.

Second, transaction costs offset much, if not all, the savings offered by trading.[185] Transaction costs seem poised to devour the possible savings of trading programs due to complexities associated with things such as trading ratios, modeling, legality, and information.

Furthermore, trading under the current regulatory scheme, or lack thereof for agricultural NPSs, represents a simple shifting of costs for the externalization of agriculture's pollution costs. Efficiency dictates that agriculture should internalize its own pollution abatement costs. But one cannot expect agricultural interests to readily accept changes in the policy of exempting agriculture from the costs of pollution abatement if such changes cost money.[186]

While it could be argued that trading proposes to remedy inefficiency by using market mechanisms to focus on the least-cost solutions, even the theoretical cost savings offered by trading depend largely on the enormous cost differentials in pollution abatement between agriculture and PSs. These cost differences, however, result because the easiest and cheapest reductions by PSs have long been requirements of the law, whereas agriculture's low marginal cost for pollution reduction comes precisely from not being subjected to similar requirements.

Furthermore, distributive concerns also arise from EPA's policy that recommends establishing baselines for creation of trading credits by looking to "the level of pollutant load associated with existing land uses and management practices that comply with applicable state, local, or tribal regulation."[187] This effectively

183. Blacklocke, *supra* note 63, at 225.

184. *See supra* note 61.

185. *See* EPA TRADING POLICY, *supra* note 6 (noting trading policies' transaction costs can overcome any savings); *see also supra* Section V.E (discussing transaction costs).

186. *See, e.g.*, FERTILE GROUND, *supra* note 11, at 25-26 (explaining that agricultural interests will want to keep agriculture exempt).

187. EPA TRADING POLICY, *supra* note 6.

incorporates existing inequities and inefficiencies of current agricultural pollution regulation into trading, thus rewarding agriculture's battle to maintain its virtual immunity to pollution regulation.

Even assuming baselines for trading were established by a modeling program that presupposed agricultural BMPs to reduce NPS pollution, one can expect that actual BMP implementation costs will still be externalized to taxpayers[188] unless the states or federal government subject agriculture to regulatory requirements to implement BMPs.[189]

In the case of agriculture and industry, one would expect agricultural interests to promote water quality trading since, as envisioned by EPA's policy, trading addresses agricultural NPS pollution without agriculture paying the bill. The agricultural lobby has continued to strenuously fight regulation of agricultural

188. This would occur, as it does now, in the form of agricultural subsidies and the CWA's § 319 program. For a description of the § 319 program attempting to deal with NPS pollution, see FERTILE GROUND, *supra* note 11, at 72-78.

189. Some might assert that it does not make any difference if taxpayers directly subsidize agriculture's NPS pollution reduction or not since taxpayers will eventually foot the bill anyway since the cost will be passed on to us as consumers in higher food costs. This could even be argued to disproportionately harm the poorest segments of society that spend a greater percentage of their budget on food. This argument not only misses the point that a miniscule part of what we pay for food goes to the farmers. *See* Brian Halweil, The Worldwatch Institute, *Farming in the Public Interest, in* STATE OF THE WORLD 2002, at 56 (2002) (noting that, in 1997, U.S. farms captured only seven percent of the money consumers spent on food products). This argument also fails to consider the economic theory of incidence analysis. Incidence analysis examines who pays for increased production costs, and emphasizes that this varies according to the extent to which the product produced can be replaced by another—elasticity—or the extent to which increased cost will simply result in fewer sales of the product. Ultimately, incidence analysis indicates that very seldom will one hundred percent of an increase in production cost be borne by the consumer; rather, it is borne by a combination of the consumer (in increased cost), the producer (in decreased profits on sales made), and again by the producer (in lost sales). *See generally* JEFFREY L. HARRISON, LAW AND ECONOMICS IN A NUTSHELL 18-20 (2d ed. 2000) (providing very accessible explanation of this often-overlooked concept). While demand overall for food products may be very inelastic since food is a necessity (*see Price Elasticity of Demand, infra*) and this would typically mean that increased production costs will be primarily borne by the consumer (*see* HARRISON, *supra*), demand for domestic agricultural goods may be more elastic depending on the substitutability of imports for domestic goods. *See* Patrick L. Anderson et al., Mackinac Ctr. for Public Policy, *Price Elasticity of Demand* (1997), *at* http://www.mackinac.org/article.asp?ID=1247 (noting that substitutability is factor in determining elasticity); HARRISON, *supra*. Thus, if increased food production costs for farmers occur, almost none of that cost would be passed on to consumers. The increased cost argument also fails to account for the fact that many existing subsidy programs encourage environmentally destructive behavior.

NPS pollution[190] and many now view water quality trading as an alternative to direct regulation of agriculture. This approach, however, depends on ratcheting down existing regulations of PSs to such low levels that the PSs, rather than fighting the stricter regulation, find it easier to advocate trading for which the PSs pay the bill. This makes trading a way to change who pays for agricultural NPS reductions; instead of taxpayers directly paying (through inefficient agricultural subsidies and polluted water), PSs will be forced to pay the bill.

In addition to the potential hardships faced by farmers forced to internalize pollution costs, such a change would also diminish the cost differentials between agricultural NPS pollution abatement and PS pollution abatement. This would undermine the feasibility of trading in the short term as a trading scheme depends on large differences in marginal costs for pollution abatement. Unfortunately, if the feasibility of trading is lost, trading's potential benefit—a market incentive for those capable of least-cost improvements in water quality to actually do so—is also lost. The loss of feasibility for trading, however, occurs *because* the same goal—getting the least-cost pollution reducers to reduce—has been accomplished by focused regulation.

Even assuming the questionable proposition that water quality trading could reduce agricultural pollution at a lower overall cost than other approaches, the question in the final analysis becomes whether the possibility of spending less money overall on water pollution reduction through trading is more valuable than equity concerns about who pays for the reductions. If it is concluded that it is, then a trading program needs to be carefully structured so that, at minimum, it does not punish the best stewards of the land and reward agriculture in general for agriculture's long struggle to remain exempt from environmental regulations.

A different market mechanism, which would be easier to implement than trading and has lower transaction costs, is a tax on fertilizers containing nitrogen and phosphorous.[191] This incorpo-

190. *See Environmental Law of Farms*, *supra* note 13, at 5 (noting that any farming proposal for comprehensive environmental regulation will be met with opposition); *see also* Williams, *supra* note 3, at 25 (pointing out reluctance of states to impose direct controls because of political power of agricultural interests); *Lessons from the Clean Air Act*, *supra* note 28, at 208 (noting that it often appears that, due to political pressures and resistance, it can prove virtually impossible to actually subject NPS polluters to additional federal authority).

191. *See* Wallace E. Oates, *Taxing Pollution: An Idea Whose Time Has Come?*, THE RFF READER IN ENVIRONMENTAL AND RESOURCE MANAGEMENT 63, 64 (Wallace E. Oates ed., 1999).

rates the idea of efficiency by allowing those using fertilizers and chemicals to determine the value of their activity without giving any one party the "right" to pollute for free.[192] Since this does not directly address the importance of sedimentation as an agricultural pollutant,[193] other mechanisms would also be necessary.

One such mechanism should be imposition of erosion performance standards for agricultural operations. Performance standards could be set using factors similar to those identified in trading ratios to focus on farms with the largest contribution to water quality standards. Farmers could then select combinations of established BMPs to comply with the focused performance standard. If it is decided that the financial cost to farmers would be so high under such requirements as to force too many out of business, subsidy programs that focus exclusively on BMPs implemented to meet performance requirements could be maintained. Theoretically, this could be cheaper than using trading to have high-cost abatement PSs pay low-cost abatement NPSs such as agriculture to reduce pollutants. For an incentive or subsidy to give rise to voluntary adoption of water protection activities such as BMPs by agriculture, the incentive must not only offset the cost of the BMPs, but

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> From this perspective, the basic cause of excessive environmental degradation is the absence of an appropriate price for scarce environmental resources. Once accepted, this proposition has a direct policy implication: the need for government to intervene and, in the absence of the interplay of supply and demand, to impose an artificial price, a tax (or effluent fee), on damaging waste emissions. It is easy to show in terms of microeconomic analysis that if this tax is set equal to the value of the damages from an additional unit of emissions, sources will have the proper incentive for controlling their discharges of pollutants. Economic analysis thus suggests the need for taxation of pollution to correct for a serious "failure" in a competitive market system.

Id.

> The economic rationale behind . . . [pollution] taxes is that those who cause pollution should bear costs. Such costs include both damages to environment and administrative costs incurred by authorities that regulate polluters. To be economically efficient, environmental taxes should reflect both of these costs.

U.S. EXPERIENCE, *supra* note 16, at 33; *see also Aftershock and Prelude, supra* note 56, at Section III.B.3 (noting that one of European Union's environmental principles is that polluter should pay). Because so much of the fertilizer applied does not get taken up by plants and thus may become pollution, application of fertilizer assures some level of pollution in most cases. *See supra* note 176.

192. A recent study by the World Resources Institute noted, however, that a trading program would likely give greater pollution reduction for its cost than would a pollution tax. *See* Suzie Greenhalgh & Amanda Sauer, World Resources Institute, *Awakening the Dead Zone: An Investment for Agriculture, Water Quality, and Climate Change* (2003), at http://pubs.wri.org/pubs_description.cfm?PubID=3803.

193. *See generally* EPA TRADING POLICY, *supra* note 6 (discussing how trading does not address problem of sedimentation).

must also have the promise of tangible benefit to those undertaking the water protection activities. Under a voluntary scheme, the way to do this is by the promise of increased profit. A regulatory scheme requiring implementation of the same BMPs could be supplemented by a subsidy covering only the cost of implementation. This would leave agriculture no worse off for complying with the regulation than agriculture was before the regulation and would decrease the amount of money needed for the change. The difficulty with this scheme is ensuring that the regulatory BMP requirements that will be subsidized are the most cost-effective ones available. This concern can be addressed by setting overall performance requirements that individual farmers can meet with their choice of many different available BMPs.

Such a system would merge the control of the farmer over which methods work best for the farmer's operation with the public's interest in cleaner water and continued viability of farms. The farmer's ability to choose, based on practical considerations, which BMPs to use, would encourage implementation of the simplest, most effective BMPs. Part of this strategy should also include technical assistance for small farms for BMP implementation regardless of whether the farmer receives a subsidy for actual implementation.[194] Unfortunately, subsidizing even the easiest, most cost-effective BMPs still rewards agriculture in general for having remained free of regulation because the costs for BMPs would be borne by the public instead of by agriculture. At least this approach is a more honest and direct subsidy to agriculture than shifting the costs to PSs under the guise of trading. Furthermore, this also allows more time to study the difficulties of transaction costs and implementation of trading.

Finally, in acknowledgment of the differences between truly mammoth, "industrial" farms and "family" farms, Professor Ruhl's suggestion of outright regulation of many aspects of industrial farms should be followed. While people have long noted the diffi-

194. An analog for this is the EPA's effort to work with smaller industries and businesses to facilitate their compliance with complex regulatory structures. *See, e.g.*, U.S. ENVIRONMENTAL PROTECTION AGENCY, SMALL BUSINESS OMBUDSMAN, *at* http://www.epa.gov/sbo/ (last modified Aug. 11, 2003) (including links to resources such as "EPA Small Business Strategy 2003," "Environmental Assistance Services for Small Businesses: A Resource Guide," "Opening Doors for America's Small Businesses," and "A Resource Directory of Small Business Environmental Assistance Providers"). This is done because EPA recognizes the disadvantages that small businesses feel they face in complying with regulations. *See* U.S. EPA, *Unifying EPA's Small Business Activities: A Strategy to Meet the Needs of Small Businesses* 1-2 (2003), *at* http://www.epa.gov/sbo/strategy2003.pdf.

culty of defining a "family" farm, EPA also has a history of regulating according to the size and nature of other industries.

These changes would help "level the playing field" between NPSs and PSs. Although "leveling the playing field" might temporarily sideline trading, trading will probably return to the field since the game of restoring the chemical, physical, and biological integrity of our Nation's waters seems far from over.